



Federal Agency for
Cartography and Geodesy



ITRF2020 application in the geodetic products for IVS

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ITRF2020 application in the BKG geodetic products for IVS

- ITRF2020 in the routine geodetic analysis
- Review of the geodetic products
- Inclusion of the VGOS sessions in the geodetic products
- Impact of the other VLBI reductions

- Geodetic products:
 - Station positions (global solution)
 - Source positions (global solution)
 - 24-h EOP time series (global solution)
 - Tropospheric parameters (global solution)

 - dUT1 time series from the single solution of the intensive sessions

Impact of the time span and datum

- Glob.c04.init0: Stations: ITRF2020 N49 stations in NNR/NNT, 1984/01-2022/07
- Glob.c04.init: Stations: ITRF2020 N46 stations (,-'NRAO85_3', 'NRAO_140', 'OVRO_130') in NNR/NNT, 1984/01-2022/07
- Glob.c04.init_2: Stations: ITRF2020 N42 stations (,-'HATCREEK', 'HAYSTACK', 'KAUAI', 'RICHMOND') in NNR/NNT, 1995/01-2022/07
- Glob.c04.ITRF: Stations: ITRF2014 (+internal adjustment and appropriate PSD-model) N46 stations in NNR/NNT, 1984/01-2022/07
- Glob.c04.ITRF_2: Glob.c04.ITRF for 1995/01-2022/07

Tx, mm	Ty, mm	Tz, mm	Alpha, mas	Betha, mas	Gamma, mas	Mu, ppb	Solution, Glob.c04.*
-0.138	-1.330	1.192	-0.003	-0.029	0.031	0.354	Init0=bkg2022a
-0.660	-2.085	1.683	0.009	-0.033	0.042	0.354	init
-1.248	0.797	0.671	-0.030	-0.031	-0.027	0.386	init_2
1.009	-0.713	1.161	-0.024	-0.010	0.024	0.284	ITRF
-1.321	2.598	0.621	-0.105	-0.063	-0.040	0.225	ITRF_2

Stations, 1995/01-2022/07

Tx, mm	Ty, mm	Tz, mm	α , mas	β , mas	γ , mas	μ , ppb	Solution, Glob.c04.*
-1.248	0.797	0.671	-0.030	-0.031	-0.027	0.386	init_2 (N42: 'AGGO', 'ALGOPARK', 'BADARY', 'BR-VLBA', 'DSS13', 'DSS45', 'DSS65A', 'FD-VLBA', 'FORTLEZA', 'HART15M', 'HARTRAO', 'HN-VLBA', 'HOBART12', 'HOBART26', 'ISHIOKA', 'KASHIMA', 'KATH12M', 'KOKEE', 'KP-VLBA', 'KUNMING', 'LA-VLBA', 'MATERA', 'MK-VLBA', 'NL-VLBA', 'NOTO', 'NRAO20', 'NYALES20', 'ONSALA60', 'OV-VLBA', 'PARKES', 'PIETOWN', 'SANTIA12', 'SC-VLBA', 'SEJONG', 'SESHAN25', 'SVETLOE', 'SYOWA', 'WARK12M', 'WESTFORD', 'WETTZ13N', 'WETTZELL', 'YARRA12M')
0.079	1.103	-1.218	-0.027	-0.008	0.002	0.447	Init_35 („-“: 'DSS13', 'DSS45', 'DSS65A', 'KASHIMA', 'PARKES', 'SANTIA12', 'SYOWA')
0.072	0.988	-1.086	-0.009	-0.008	0.016	0.481	Init_32 („-“ 'AGGO', 'SEJONG', 'WETTZ13N')
0.082	0.489	-0.735	0.004	-0.008	0.022	0.502	Init_28 („-“ 'ALGOPARK', 'KUNMING', 'NRAO20', 'PIETOWN')
0.118	-0.162	-0.324	0.003	-0.004	0.016	0.477	Init_19 („-“ 9 „VLBA“)
0.098	-0.497	-0.772	-0.007	0.009	-0.003	0.495	Init_18 („-“ 'ISHIOKA')
-0.265	0.027	-1.810	-0.007	0.024	0.007	0.499	Init_12 („-“ 'BADARY', 'HART15M', 'HOBART12', 'KATH12M', 'WARK12M', 'YARRA12M')
0.539	-0.050	-1.034	-0.039	0.006	-0.031	0.483	Init_22 (Init_19+ 'AGGO', 'SEJONG', 'WETTZ13N')
0.091	-0.186	-0.305	0.004	-0.005	0.014	0.485	N19.no VGOS

Stations, 1995/01-2022/07

Tx, mm	Ty, mm	Tz, mm	α , mas	β , mas	γ , mas	μ , ppb	Solution, Glob.c04.*
0.056	-0.234	-0.275	-0.003	-0.002	0.007	0.471	Init_20 (Init_19+ 'SEJONG')
0.700	-0.007	-1.041	-0.034	0.001	-0.026	0.488	Init_20 (Init_19+ 'AGGO')
0.003	-0.154	-0.361	0.004	-0.006	0.017	0.460	Init_20 (Init_19+'WETTZ13N')
0.539	-0.050	-1.034	-0.039	0.006	-0.031	0.483	Init_22 (Init_19 + 'AGGO', 'SEJONG','WETTZ13N')
0.582	-0.019	-1.073	-0.036	0.005	-0.028	0.499	Init_21 (Init_19+ 'AGGO', 'WETTZ13N')
-0.051	-0.225	-0.317	-0.002	-0.004	0.008	0.455	Init_21 (Init_19+ 'SEJONG', 'WETTZ13N')
0.644	-0.036	-1.005	-0.038	0.003	-0.030	0.471	Init_22 (Init_19+ " 'AGGO', 'SEJONG')
0.118	-0.162	-0.324	0.003	-0.004	0.016	0.477	Init_19 („-“ 9 „VLBA“)

Impact of the source parameterization, 1995/01-2022/07

- Glob.c04.init: Sources: NNR on defing sources (standard solution)
- Glob.c04.abs: Sources: Absolute constraints (tight) on all sources
- Glob.c04.no: Sources: No constraints

Tx, mm	Ty, mm	Tz, mm	Alpha, mas	Betha, mas	Gamma, mas	Mu, ppb	Solution, Glob.c04.*
-1.248	0.797	0.671	-0.030	-0.031	-0.027	0.386	init_2
-1.295	0.824	0.636	-0.031	-0.032	-0.027	0.385	abs
-1.266	0.950	0.797	-0.032	-0.029	-0.030	0.388	No any
0.118	-0.162	-0.324	0.003	-0.004	0.016	0.477	N19
0.135	-0.161	-0.327	0.003	-0.004	0.016	0.479	N19-abs
0.110	-0.162	-0.323	0.003	-0.004	0.016	0.481	N19-no any

ITRF2020 in the routine geodetic analysis

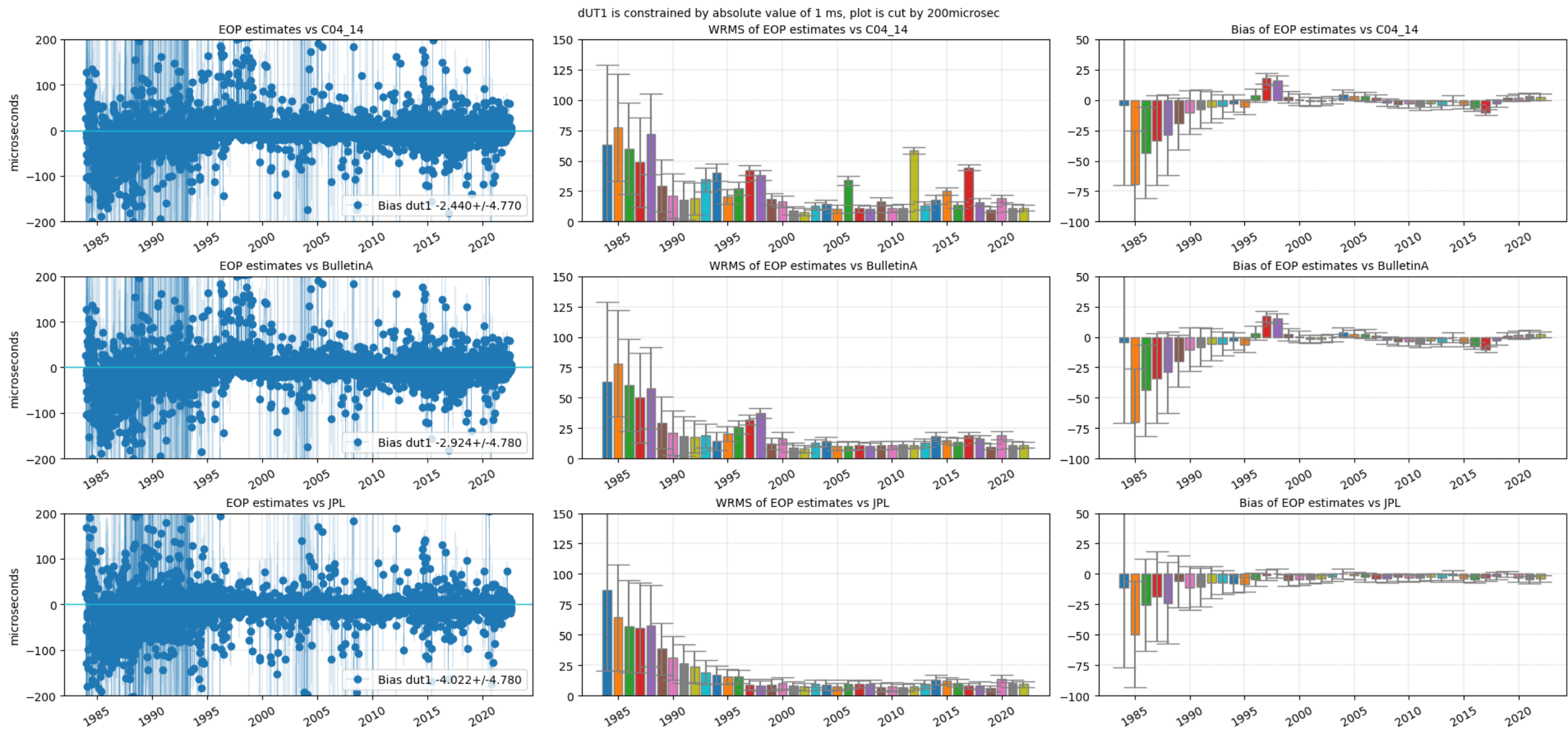
Impact of the a priori EOP corrections

- Glob.c04.init0: C04 14, Stations: ITRF2020 49 stations in NNR/NNT, 1984/01-2022/07
- Glob.c04.init_2: C04 14, Stations: ITRF2020 46 stations in NNR/NNT 1995/01-2022/07
- Glob.erp.init0: Bulletin A, Stations: ITRF2020 49 stations in NNR/NNT, 1984/01-2022/07
- Glob.erp.init_2: Bulletin A, Stations: ITRF2020 46 stations in NNR/NNT 1995/01-2022/07

Tx, mm	Ty, mm	Tz, mm	Alpha, mas	Betha, mas	Gamma, mas	Mu, ppb	Solution, Glob.*
-0.138	-1.330	1.192	-0.003	-0.029	0.031	0.354	c04.init0
-0.166	-1.292	1.112	-0.003	-0.030	0.031	0.354	erp.init0
-1.248	0.797	0.671	-0.030	-0.031	-0.027	0.386	c04.init_2
-1.117	0.660	0.594	-0.030	-0.028	-0.030	0.386	erp.init_2
0.118	-0.162	-0.324	0.003	-0.004	0.016	0.477	c04.N19
0.119	-0.163	-0.324	0.003	-0.004	0.016	0.477	erp.N19

ITRF2020 in the routine geodetic analysis

dUT1 estimates from bkg2022a



ITRF2020 in the routine geodetic analysis

EOP: Bias, N42 in NNR/NNT

EOP a priori	dUT1, microsec	LOD, ms	Xp, mas	Yp, mas	dX, mas	dY, mas	Solution
C04_14 Bulletin A JPL	-2.440 -2.924+/-4.780 -4.022	0.002+/-0.013	0.052 0.052+/-0.103 0.048	0.025 0.024+/-0.087 0.033	0.038 +/-0.069 0.030	0.064 +/-0.070 0.060	Init0_2 1984/01- 2022/07
C04_14 Bulletin A JPL	-4.576 -5.034+/-3.830 -7.020	0.002+/-0.009	0.042 0.041+/-0.084 0.021	0.041 0.041+/-0.077 0.053	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	Init_2 1995/01- 2022/07
C04_14 Bulletin A JPL	-5.084 -5.558+/-3.830 -7.740	0.002+/-0.009	0.039 0.039+/-0.084 0.018	0.042 0.041+/-0.077 0.053	0.039 +/-0.053 0.023	0.061 +/-0.053 0.068	BulletinA_2 1995/01- 2022/07
C04_14 Bulletin A JPL	14.926 14.455+/-3.830 11.906	0.002+/-0.009	0.184 0.185+/-0.084 0.164	-0.122 -0.123+/-0.077 -0.108	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	ITRF 1995/01- 2022/07

ITRF2020 in the routine geodetic analysis

EOP: Bias

Difference wrt	dUT1, μsec	Solution
C04_14 Bulletin A JPL	-4.576 -5.034+/-3.830 -7.020	Init_2, N42
C04_14 Bulletin A JPL	-0.246 -0.738+/-3.310 -2.744	Init_2, N28 („-“:'AGGO', 'ALGOPARK', 'DSS13', 'DSS45', 'DSS65A', 'KASHIMA', 'KUNMING', 'NRAO20', 'PARKES', 'PIETOWN', 'SANTIA12', 'SEJONG', 'SYOWA', 'WETTZ13N')
C04_14 Bulletin A JPL	2.235 1.808+/-3.320 -0.487	Init_19 („-“ 9 „VLBA“)
C04_14 Bulletin A JPL	-1.924 -2.327+/-3.315 -4.494	Init_18 („-“ Ishioka)
C04_14 Bulletin A JPL	-1.589 -2.030+/-3.310 -4.201	Init_12 (,-' 'BADARY', 'HART15M', 'HOBART12', 'KATH12M', 'WARK12M', 'YARRA12M')

ITRF2020 in the routine geodetic analysis

EOP: Bias

	Difference wrt	dUT1, μ sec	Solution	dUT1, μ sec	Solution
C04_14 Bulletin A JPL		-4.576 -5.034+/-3.830 -7.020	Init_2 N42	1.033 0.511+/-3.320 -1.716	N19 +SEJONG
C04_14 Bulletin A JPL		2.235 1.808+/-3.320 -0.487	N19	-0.777 -1.185+/-3.560 -3.256	N19 +AGGO
C04_14 Bulletin A JPL		2.369 1.981+/-3.375 -0.418	N19 -VGOS	2.212 1.753+/-3.320 -0.546	N19 +WZ13N
C04_14 Bulletin A JPL		1.923 1.468+/-3.320 -0.983	N19 -BulletinA	-1.859 -2.247+/-3.540 -4.253	N19 +SEJONG +AGGO
C04_14 Bulletin A JPL		-1.924 -2.327+/-3.315 -4.494	N18	1.041 0.524+/-3.320 -1.758	N19 +SEJONG +WZ13N
C04_14 Bulletin A JPL		-1.589 -2.030+/-3.310 -4.201	N12	-1.916 -2.287+/-3.540 -4.320	N19+SEJONG +WZ13N +AGGO

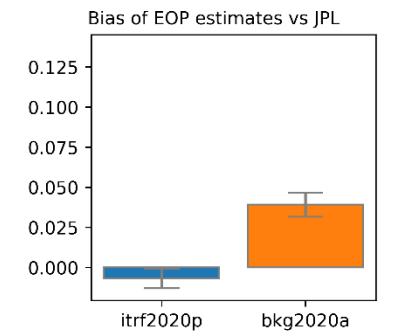
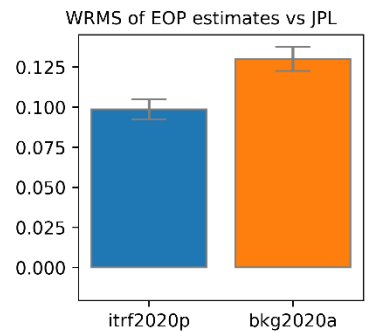
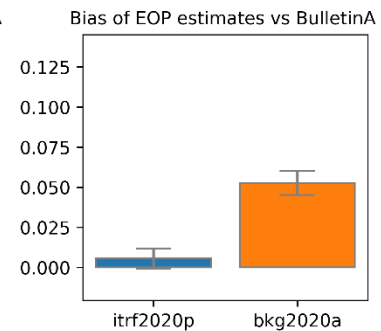
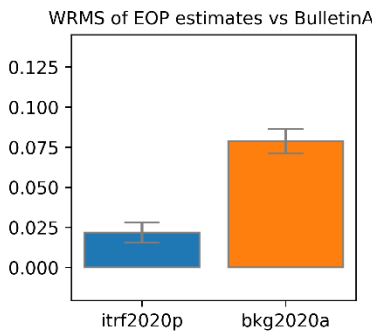
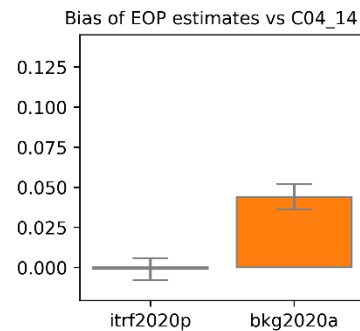
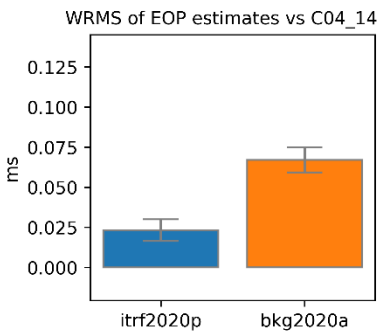
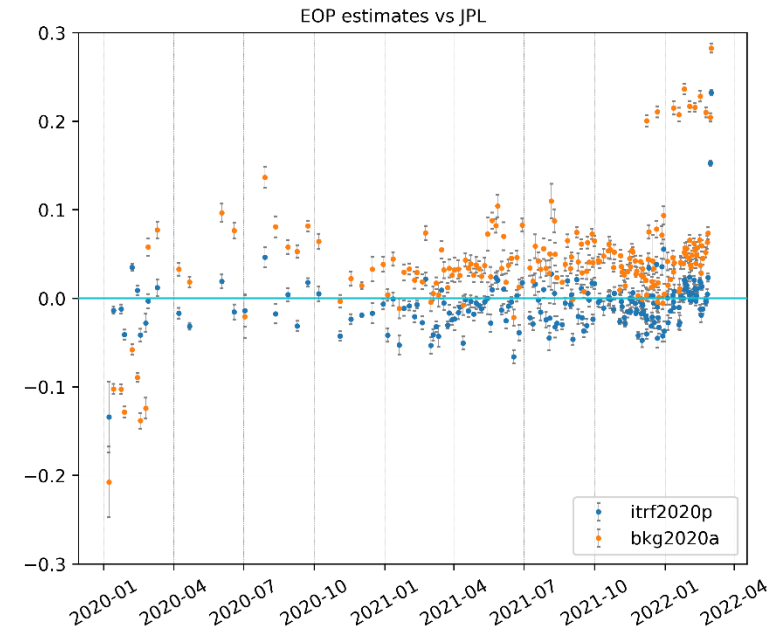
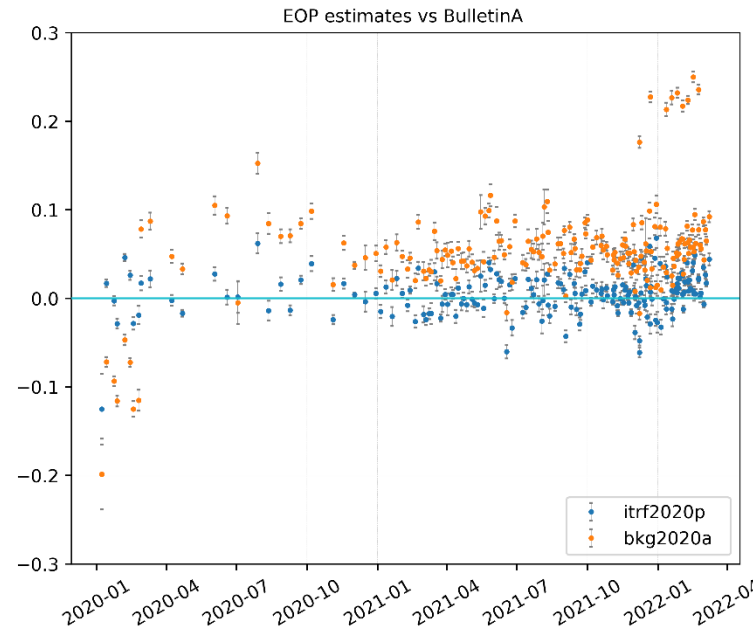
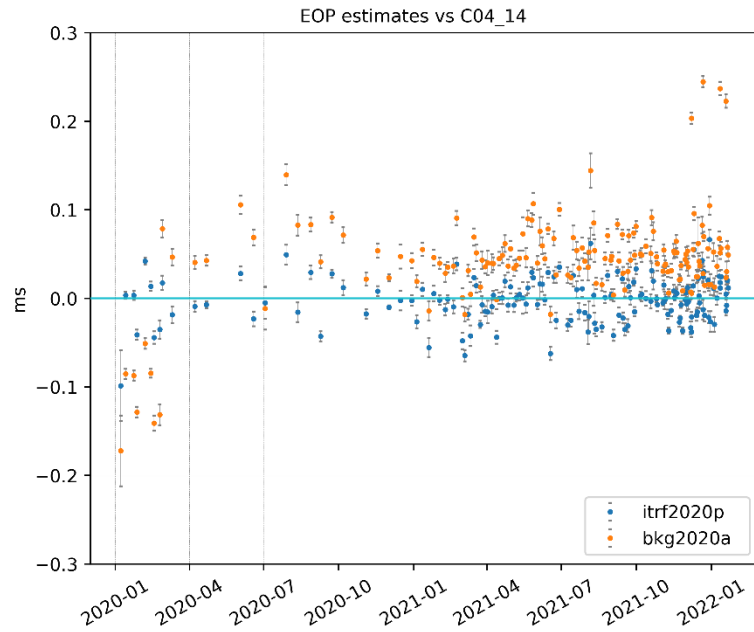
ITRF2020 in the routine geodetic analysis

EOP: Bias

Difference wrt	dUT1, μsec	LOD, ms	Xp, mas	Yp, mas	dX, mas	dY, mas	Solution
C04_14 Bulletin A JPL	2.235 1.808+/-3.320 -0.487	0.002+/-0.009	0.045 0.045+/-0.079 0.021	-0.036 -0.036+/-0.066 -0.021	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19
C04_14 Bulletin A JPL	-7.468 -7.915+/-3.420 -10.222	0.002+/-0.009	0.045 0.046+/-0.079 0.021	-0.036 -0.036+/-0.066 -0.020	-0.022 +/-0.054 -0.037	-0.013 +/-0.053 -0.008	Source: absolute constraints
C04_14 Bulletin A JPL	41.257 40.859+/-39.048 -45.000	0.002+/-0.009	0.045 0.045+/-0.079 0.021	-0.037 -0.037+/-0.066 -0.021	-69.035 +/-6.187 -69.051	-245.155 +/-6.380 -245.151	Source: no constraints

Differences of the dUT1 estimates derived from bkg2020a and the altered bkg2020a for station position ITRF2020P: all VGOS Intensives

Intensive: INT VGOS



- ITRF2020 in the routine geodetic analysis
 - Comparison with ITRF2014 (+internal adjustment and appropriate PSD-model), Helmert transformation, dUT1 bias
 - No impact of VGOS sessions
- Further review of parametrization to reduce the parameter estimation step to gain most of the VGOS sessions and keep them intact with the rest of the sessions
- The a priori station positions are crucial for intensive session analysis. In this case VGOS station positions are improved significantly
- The impact of Atmospheric Pressure Loading is recognized in the change of the Helmert parameters and BLR



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Thank you very much for your attention.

Stations, 1984/01-2022/07

- Glob.c04.init0: Stations: ITRF2020 49 stations in NNR/NNT
- Glob.c04.init: Stations: ITRF2020 46 stations in NNR/NNT
- Glob.c04.itrf: Stations: ITRF2014 (+internal adjustment and appropriate PSD-model) 46 stations
- Glob.c04.novgos: Stations: ITRF2020 46 stations in NNR/NNT, VGOS sessions are excluded
- Glob.c04.noSEJONG: Stations: ITRF2020 45 stations in NNR/NNT
- Glob.c04.noWZ13N: Stations: ITRF2020 44 stations in NNR/NNT

Tx, mm	Ty, mm	Tz, mm	Alpha, mas	Betha, mas	Gamma, mas	Mu, ppb	Solution
-0.138	-1.330	1.192	-0.003	-0.029	0.031	0.354	Glob.c04.init0
-0.660	-2.085	1.683	0.009	-0.033	0.042	0.354	Glob.c04.init
1.009	-0.713	1.161	-0.024	-0.010	0.024	0.284	Glob.c04.itrf
-0.734	-2.152	1.748	0.011	-0.037	0.041	0.362	Glob.c04.novgos
-0.708	-1.981	1.732	0.004	-0.035	0.040	0.371	Glob.c04.no SEJONG
-0.654	-2.026	1.777	0.002	-0.034	0.042	0.375	Glob.c04.no SEJONG WZ13N

Stations, 1995/01-2022/07

- Glob.c04.init_2: Stations: ITRF2020 46 staitons in NNR/NNT
- Glob.c04.novgos: Stations: ITRF2020 46 staitons in NNR/NNT, VGOS sessions are excluded
- Glob.c04.noSEJONG: Stations: ITRF2020 45 staitons in NNR/NNT
- Glob.c04. noSEJONG_WZ13N: Stations: ITRF2020 44 staitons in NNR/NNT
- Glob.c04.noSEJONG_WZ13N_AGGO: Stations: ITRF2020 43 staitons in NNR/NNT

Tx, mm	Ty, mm	Tz, mm	Alpha, mas	Betha, mas	Gamma, mas	Mu, ppb	Solution, Glob.c04.*
-1.248	0.797	0.671	-0.030	-0.031	-0.027	0.386	init_2 (N46)
-1.415	0.764	0.725	-0.030	-0.037	-0.026	0.398	noVGOS (N46)
-1.360	0.940	0.684	-0.035	-0.031	-0.033	0.413	N45: noSEJONG*
-1.323	0.940	0.711	-0.034	-0.030	-0.032	0.417	N44: noSEJONG WZ13N*
-1.363	0.837	0.876	-0.026	-0.028	-0.028	0.426	N43: noSEJONG WZ13N AGGO*

- Solutions are practically identical in terms of the baseline length repeatability.
- ISHIOKA RAEGYEB (globl) 6778 535 Reduction of the BLR -17.3

Stations, 1995/01-2022/07, Atmospheric Pressure Loading (APL)

- Glob.c04.init_2: Stations: ITRF2020 46 stations in NNR/NNT
- Glob.c04.apl: Stations: ITRF2020 46 stations in NNR/NNT, APL corrections based on GFZ product
- Glob.c04.noapl: Stations: ITRF2020 46 stations in NNR/NNT, no corrections for APL

Tx, mm	Ty, mm	Tz, mm	Alpha, mas	Betha, mas	Gamma, mas	Mu, ppb	Solution
-1.248	0.797	0.671	-0.030	-0.031	-0.027	0.386	init_2
-1.266	0.950	0.797	-0.032	-0.029	-0.030	0.388	Solve 22
-1.804	1.260	0.658	-0.050	-0.039	-0.033	0.363	Glob.c04.apl
-1.295	0.824	0.636	-0.031	-0.032	-0.027	0.385	Solve 22
-1.307	0.589	0.481	-0.028	-0.036	-0.021	0.351	Glob.c04.noapl

ITRF2020 in the routine geodetic analysis

EOP: Bias

Difference wrt	dUT1, μsec	LOD, ms	Xp, mas	Yp, mas	dX, mas	dY, mas	Solution
C04_14 Bulletin A JPL	-4.576 -5.034 \pm 3.830 -7.020	0.002 \pm 0.009	0.042 0.041 \pm 0.084 0.021	0.041 0.041 \pm 0.077 0.053	0.038 \pm 0.053 0.023	0.062 \pm 0.053 0.067	Init_2 N42
C04_14 Bulletin A JPL	-0.246 -0.738 \pm 3.310 -2.744	0.002 \pm 0.009	0.040 0.040 \pm 0.079 0.018	-0.013 -0.013 \pm 0.066 -0.000	0.038 \pm 0.053 0.023	0.062 \pm 0.053 0.067	Init_2 N28
C04_14 Bulletin A JPL	2.235 1.808 \pm 3.320 -0.487	0.002 \pm 0.009	0.045 0.045 \pm 0.079 0.021	-0.036 -0.036 \pm 0.066 -0.021	0.038 \pm 0.053 0.023	0.062 \pm 0.053 0.067	N19
C04_14 Bulletin A JPL	-1.924 -2.327 \pm 3.315 -4.494	0.002 \pm 0.009	0.007 0.007 \pm 0.079 -0.013	-0.012 -0.013 \pm 0.066 0.002	0.038 \pm 0.053 0.023	0.062 \pm 0.053 0.067	N18
C04_14 Bulletin A JPL	-1.589 -2.030 \pm 3.310 -4.201	0.002 \pm 0.009	-0.011 -0.011 \pm 0.079 -0.029	-0.007 -0.007 \pm 0.066 0.005	0.038 \pm 0.053 0.023	0.062 \pm 0.053 0.067	N12

ITRF2020 in the routine geodetic analysis

EOP: Bias

Difference wrt	dUT1, μsec	LOD, ms	Xp, mas	Yp, mas	dX, mas	dY, mas	Solution
C04_14 Bulletin A JPL	-4.576 -5.034+/-3.830 -7.020	0.002+/-0.009	0.042 0.041+/-0.084 0.021	0.041 0.041+/-0.077 0.053	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	Init_2 N42
C04_14 Bulletin A JPL	1.033 0.511+/-3.320 -1.716	0.002+/-0.009	0.040 0.040+/-0.079 0.017	-0.025 -0.026+/-0.066 -0.010	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19 +SEJONG
C04_14 Bulletin A JPL	-1.916 -2.287+/-3.540 -4.320	0.002+/-0.009	0.033 0.032+/-0.080 0.010	0.052 0.052+/-0.069 0.064	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19+3
C04_14 Bulletin A JPL	2.235 1.808+/-3.320 -0.487	0.002+/-0.009	0.045 0.045+/-0.079 0.021	-0.036 -0.036+/-0.066 -0.021	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19
C04_14 Bulletin A JPL	-1.924 -2.327+/-3.315 -4.494	0.002+/-0.009	0.007 0.007+/-0.079 -0.013	-0.012 -0.013+/-0.066 0.002	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N18
C04_14 Bulletin A JPL	-1.589 -2.030+/-3.310 -4.201	0.002+/-0.009	-0.011 -0.011+/-0.079 -0.029	-0.007 -0.007+/-0.066 0.005	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N12

ITRF2020 in the routine geodetic analysis

EOP: Bias

Difference wrt	dUT1, μsec	LOD, ms	Xp, mas	Yp, mas	dX, mas	dY, mas	Solution
C04_14 Bulletin A JPL	1.033 0.511+/-3.320 -1.716	0.002+/-0.009	0.040 0.040+/-0.079 0.017	-0.025 -0.026+/-0.066 -0.010	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19 +SEJONG
C04_14 Bulletin A JPL	-1.916 -2.287+/-3.540 -4.320	0.002+/-0.009	0.033 0.032+/-0.080 0.010	0.052 0.052+/-0.069 0.064	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19+3
C04_14 Bulletin A JPL	2.235 1.808+/-3.320 -0.487	0.002+/-0.009	0.045 0.045+/-0.079 0.021	-0.036 -0.036+/-0.066 -0.021	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19
C04_14 Bulletin A JPL	-0.777 -1.185+/-3.560 -3.256	0.002+/-0.009	0.041 0.042+/-0.080 0.018	0.043 0.044+/-0.069 0.056	Bias dx 0.038+/- 0.053 Bias dx 0.023+/- 0.053	Bias dy 0.062+/- 0.053 Bias dy 0.067+/- 0.053	N19+AGGO
C04_14 Bulletin A JPL	2.212 1.753+/-3.320 -0.546	0.002+/-0.009	0.043+/-0.079 0.044+/-0.079 0.020+/-0.079	-0.037+/-0.066 -0.037+/-0.066 -0.021+/-0.066	Bias dx 0.038+/- 0.053 Bias dx 0.023+/- 0.053	Bias dy 0.062+/- 0.053 Bias dy 0.067+/- 0.053	N19 +WZ13N

ITRF2020 in the routine geodetic analysis

EOP: Bias

Difference wrt	dUT1, μ sec	LOD, ms	Xp, mas	Yp, mas	dX, mas	dY, mas	Solution
C04_14 Bulletin A JPL	1.033 0.511+/-3.320 -1.716	0.002+/-0.009	0.040 0.040+/-0.079 0.017	-0.025 -0.026+/-0.066 -0.010	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19 +SEJONG
C04_14 Bulletin A JPL	2.235 1.808+/-3.320 -0.487	0.002+/-0.009	0.045 0.045+/-0.079 0.021	-0.036 -0.036+/-0.066 -0.021	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19
C04_14 Bulletin A JPL	-1.859 -2.247+/-3.540 -4.253	0.002+/-0.009	0.038 0.037+/-0.080 0.015	0.053 0.053+/-0.069 0.065	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19 +SEJONG +AGGO
C04_14 Bulletin A JPL	1.041 0.524+/-3.320 -1.758	0.002+/-0.009	0.040 0.040+/-0.079 0.017	-0.026 -0.026+/-0.066 -0.011	0.038 +/-0.053 0.023	0.062 +/-0.053 0.067	N19 +SEJONG +WZ13N
C04_14 Bulletin A JPL	2.369 1.981+/-3.375 -0.418	0.002+/-0.010	0.045 0.045+/-0.080 0.022	-0.035 -0.035+/-0.067 -0.019	0.038 +/-0.054 0.024	0.062 +/-0.054 0.067	N19 -VGOS
C04_14 Bulletin A JPL	1.923 1.468+/-3.320 -0.983	0.002+/-0.009	0.045 0.044+/-0.079 0.021	-0.037 -0.037+/-0.066 -0.020	0.039 +/-0.053 0.023	0.061 +/-0.053 0.068	N19 -BulletinA